Natalie Wood

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Dr. Leech

Sophomore Seminar

The solution to human limb regrowth using Salamanders?

Imagine going through a horrific car accident and becoming a bilateral amputate, someone who has lost both their legs, never being able to walk again or perform normal activities you once had. What if humans had the ability to regrow parts of their bodies: Legs, arms, tongues, fingers etc.? A specific salamander named axolotl found in Xochimilco Mexico, has the unique ability to regrow their limbs, jaw, spinal cord, and skin in perfect condition. Other salamanders have regenerating abilities, but mostly in their tails. Can we find a way to connect axolotl’s regrowth abilities to human regrowth, know why they have this unique ability, and why are the axolotl’s so different than any other salamander?

How did regeneration appear in the amphibian species? It is shown that many years ago the ancestors of modern salamanders possessed the ability to regrow their limbs. A 300-Million-year-old amphibian species *Micromelerpeton* had the ability of limb regrowth*.* This ability is thought to be passed down through generations of genes throughout the amphibian species or locally through natural selection.

The process of limb regrowth in axolotls can be very complicated. Once the limb is detached, epidermal cells, the outer layer of the skin cells, are collected at the site. Through Proliferation, the rapid increase of cells, formative material from which cells are developed. Through this development, a bulbous structure flattens and cartilage cells condense. The tissue then differentiates and a new limb is formed. When thinking about the process of regeneration it is easy to compare this to wound healing in humans. When humans get a cut, their skin heals back together. On a smaller scale this can be compared to axolotl’s regrowth, but instead of the skin healing back together, axolotl’s grow a perfect limb. On a bigger scale, of course, it’s more complex and the process is different, but in comparison, it can be similar.

The axolotls are highly studied in labs for their unique ability, having many experiments performed on them. The Most common experiment being a skin graft. A skin graft is a procedure that involves a healthy piece of skin that is transplanted to a new spot on the body, usually performed on the upper arms. When this healthy skin is transplanted, a new limb grows from that healthy skin leaving the axolotl with 5 arms. Normally the skin on any other animal would just heal back together, but with the axolotl’s the nerves and cells become a new limb instead of just simply healing.

The axolotl is not the only salamander that can regenerate. In fact, most salamanders if not all, can regenerate, but mostly in their tails. Morrison found that the salamanders process of regeneration starts with histolysis, increased cellular proliferation, and dedifferentiation, a process by which a structure that was specialized for a specific function becomes simplified. This is similar to the axolotl’s process and just like the axolotls, the skin graft procedure is also widely performed on salamanders of all kinds. These studies are used to show the function of connective tissue fibroblasts, a cell in tissue that produces colognes and other fibers, and how it induces patterns by cell contribution studies.

If you lost your leg in a car accident wouldn’t it be amazing if you were able to regrow a perfect new leg, not having to worry about the struggle of not having one? The scientists over the years have been trying to figure out a way to connect axolotl’s limb regenerations to humans, but when comparing axolotl’s and salamanders to their regeneration, there have not been enough studies that show any similarities or differences between them. Most of the read articles have been about the overall aspect of the axolotl’s regenerating limbs. Therefore because of this conclusion, my thesis could not be directly answered. Some future direction that should be considered is, will there ever be a way to use salamanders, like axolotl’s, for humans to regenerate spinal cords, limb, etc? One of my thoughts is that us humans have the ability to regenerate, but we have not yet triggered the biological way to do so. Even though my thesis could not be answered, the aspect of future direction can be greatly considered with more research and detailed studies.

Work Cited

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